

# Cashless Campus: Fund Management Using Micropayment Technique.

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**Abstract** - This project introduces an innovative approach to financial management within the college setting, presenting a unified and multifunctional application for cashless transactions. Through the utilization of smartphones, which are widely used by students, this application offers a centralized platform for accessing vital campus services and information. Its intuitive UI makes it easier to do things like issuing a book from library, and pay for things in the cafeteria and stationery store on campus. Furthermore, the application facilitates effective communication between administrators and students by offering functionalities such as transaction history, low balance alerts, and impending event notifications. In addition, the integration of QR code technology improves security, seamless and comfortable interactions. All things considered, this Android app offers a progressive approach to college administration that uses mobile technology to improve accessibility, effectiveness, and general satisfaction.

**Key Words:** QR Code Image Generation, QR Code Image Detection, Micropayment, Campus Services, Student Administrator Communication, Transaction History.

## 1. INTRODUCTION

In today's digital age, the demand for efficient and secure payment systems within educational institutions has become increasingly evident. Our project aims to revolutionize the way students make payments on campus by introducing a comprehensive online platform. This platform will enable students to utilize a singular QR code for seamless transactions at various campus facilities, including the canteen, library, and stationary stores.

The primary objective of this project is to address the prevalent challenges associated with traditional cash-based transactions within educational settings. By leveraging modern technology and innovative payment solutions, we strive to enhance the overall experience for students and administrative staff alike, ensuring convenience, speed, and accuracy in financial transactions.

## 2. AIM OF PROJECT

The project aims to create an Android app to enhance campus life by leveraging smartphone ubiquity. It provides a centralized platform for assessing campus services, streamlining processes like course registration and library access using intuitive design and QR code technology.

Additionally, the app facilitates transparent communication between student and administrators through real time notifications. Overall, it seeks to boost accessibility, efficiency, and satisfaction for both students and administrative staff.

## 3. OBJECTIVE OF THE PROJECT

The main objectives of this system are:

- Simplify student life by offering a user-friendly mobile application.
- Enhance accessibility to campus services like the canteen, library, and stationary store.
- Ensure secure and transparent financial transactions using unique QR codes.
- Enable effective communication between students and administrators.
- Empower administrators with comprehensive oversight capabilities.
- Promote student engagement through real-time notifications.
- Utilize technology to optimize campus management processes.
- Foster a sense of community and collaboration among students and administrators.

## 4. PROBLEM STATEMENT

Traditional payment methods on campuses often involve the cumbersome handling of physical currency, leading to inconveniences such as long queues, errors in accounting, and difficulties in tracking transactions. Students frequently encounter challenges in managing cash for daily expenditures as well as often face challenges in staying updated with important information, while administrative staff struggle with manual record-keeping and reconciliation processes. These inefficiencies not only disrupt the smooth functioning of campus facilities but also impact the overall productivity and satisfaction of the campus community.

The lack of a unified, digital payment system exacerbates these issues, creating an urgent need for a solution that streamlines financial transactions within the campus

environment. Our project seeks to bridge this gap by offering a secure, efficient, and user-friendly digital payment platform tailored specifically to the needs of students and campus service providers.

### 5. PROPOSED SYSTEM

The goal of the planned digital payment infrastructure for campus amenities is to make transactions across different facilities—like the canteen, library, and stationary stores—more efficient by using unique QR codes that are provided to each student. To secure login and access to the site, students begin their involvement by registering with basic information such as name, branch, year, and college ID. Students may easily access services like seeing cafeteria menus, perusing and checking out books from the library, and making purchases of stationery by scanning QR codes after they have checked in. The portal also provides students with the ease of tracking borrowed books, monitoring transaction histories, checking balances, and contacting administrators directly using a query option. Administrators are provided with effective tools by the system to manage student data and transactions. They can provide students individual QR codes, update accounts with monies received, and promptly remind students about tests. Additionally, the platform records every transaction, giving administrators valuable information on how students behave and how the facilities are used. To ensure that the system can adapt to changing needs on campus, administrators can also update information on book lists, stationary goods, and canteen menus. Essentially, this technology gives administrators complete supervision and administrative capabilities while also making campus transactions easier for students.

#### 5.1 Advantages of Proposed System

- Streamlined registration and login process for students.
- Convenient access to campus services like the canteen, library, and stationary shop.
- Cashless transactions using QR code scanning, enhancing security and convenience.
- Timely notifications for borrowed library books, late penalties, and low balances.
- Easy tracking of remaining balances and transaction history for students.
- Efficient management of student data and transactions for administrators.

#### 5.2 Functional Requirement

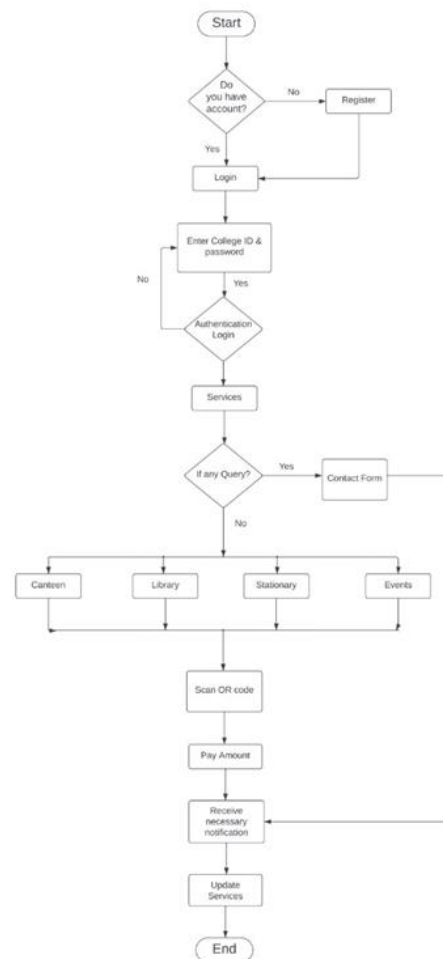
- Users should be able to log in using their college ID and password.
- Provide a section for users to send queries to admin email.

- Allow admin access to student history and details sorted by branch and year.
- Assign unique QR codes to students upon registration
- Allow admin to update canteen menu, book list, and stationary items list.

#### 5.3 Non-functional Requirement

- The system should be able to handle a growing number of users and transactions without significant degradation in performance.
- Mobile apps should be connected with the internet.

#### 5.4 Flow-Chart



**Chart -1:** Flow chart

#### 5.5 Features

- An advanced meal ordering system that saves the user time by allowing them to place their orders directly from the application, eliminating the need to go get food.

- With the app, students can quickly check how many books are issued in their names and conveniently issue a book from the library.
- The application's interactive features allow users to receive notification about when the issued book needs to be returned within a certain span of time.
- Reducing the amount of paper used by creating soft copies of invoices that both vendors and students may access.
- There is no requirement to pay any fees because there is no payment interface.

## 6. EXISTING SYSTEM

Currently, the campus operates on traditional payment methods, predominantly reliant on cash transactions at the canteen, library, and stationary stores. While some facilities might accept card payments, the absence of a unified digital platform results in fragmented payment experiences for students. These systems lack synchronization, leading to inefficiencies in tracking expenditures and managing accounts.

Moreover, the reliance on physical currency poses security risks and operational challenges, including the need for constant cash handling, increased possibilities of errors, and the inconvenience of carrying and managing cash for both students and administrative staff.

### 6.1 Disadvantages of Existing System

- Manual processes are time-consuming and prone to errors.
- Limited accessibility to campus services leads to inconvenience for students.
- Communication between students and administrators is often delayed or inefficient.
- Difficulty in tracking student activities such as library book returns or canteen transactions.
- Security risks associated with handling data manually.
- Lack of real-time updates.

## 7. METHODOLOGY

Our project follows a comprehensive framework designed to ensure the delivery of a high-quality software solution that enhances the campus experience for all users. We start by meticulously gathering and analyzing requirements from all stakeholders through interviews, surveys, and workshops to understand the needs and expectations of the end-users. Detailed documentation is created to capture these requirements, forming the foundation for the entire project.

Using the collected requirements, we move into the design phase, creating initial prototypes and mockups. These designs are reviewed and refined through iterative cycles, incorporating feedback from stakeholders at each stage to ensure alignment with their vision and needs.

Development is carried out in iterative sprints, allowing for incremental progress and regular assessment. Each sprint focuses on implementing a specific set of features, which are then reviewed and tested before moving on to the next iteration. Our tech stack includes robust tools like MySQL for data storage, ensuring efficient and secure data management, and Flask, a lightweight and flexible framework, is used for developing the backend, particularly suitable for Android application development.

Throughout the design, development, and testing phases, continuous communication with stakeholders is maintained through regular meetings, updates, and demo sessions to gather feedback and make necessary adjustments, ensuring the project remains on track and meets user expectations. Rigorous testing is an integral part of our process, including unit testing, integration testing, system testing, and user acceptance testing (UAT). Test cases are designed to cover all possible scenarios, ensuring the software is free from bugs and performs reliably under various conditions.

Once the software passes all testing phases, it is prepared for deployment. This involves setting up the production environment, configuring servers, and ensuring all dependencies are correctly managed. A rollout plan is created to ensure a smooth transition, minimizing any disruption to users. After deployment, we provide ongoing support to address any issues that may arise and to ensure the software continues to function as intended. User feedback is continually monitored to make further improvements and updates as needed.

Our methodical approach, characterized by meticulous planning, continuous feedback, thorough testing, and careful deployment, aims to deliver a stable and reliable software solution. The ultimate goal is to enhance the campus experience for all users, providing a seamless and user-friendly application that meets their needs effectively. By adhering to this structured framework, we ensure that our project not only meets but exceeds expectations, delivering a high-quality, stable, and user-centric software solution.

## 8. TECHNOLOGIES USED

### Android:

Android provides a rich application framework that allows you to build innovative apps and games for mobile devices in a Java language environment. The documents listed in the left navigation provide details about how to build apps using Android's various APIs. Android apps are built as a combination of distinct components that can be

invoked individually. For instance, an individual activity provides a single screen for a user interface, and a service independently performs work in the background.

**Python:**

Python is a versatile, high-level programming language known for its simplicity and readability. It supports object-oriented programming, dynamic typing, and dynamic binding, making it ideal for rapid development and scripting tasks. With no compilation step, the development cycle is fast, and debugging is straight forward because of built-in error handling and a source-level debugger. Python's extensive standard library, modularity, and code reuse capabilities further enhance its appeal to developers.

**Flask:**

Flask is a lightweight web application framework for Python, designed for flexibility and speed. It simplifies web development by handling environment and project setup, allowing developers to focus on their application logic rather than low-level details like HTTP handling and routing. While Flask lacks built-in features like database abstraction and form validation, it supports extensions for adding such functionalities. Originally created as a joke, Flask gained popularity due to its simplicity and extensibility, becoming one of the most popular Python web frameworks alongside Django.

These are some Important features of the Flask:

- It is a Development Server.
- Debugger.
- RESTful request dispatching.
- Unicode Based.
- It has google app engine Compatibility.

**8.1 Use Case Diagram**

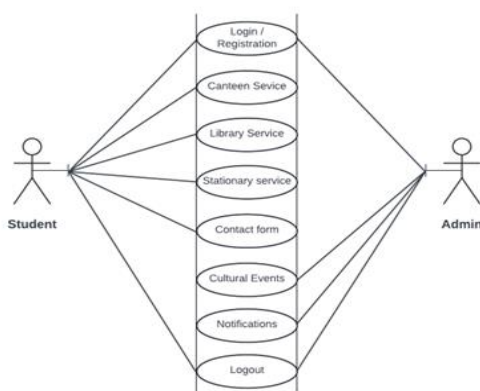


Fig – 1: Use case diagram

**9. CONCEPTS USED**

Our system utilizes QR code technology for secure student identification and transaction authentication, ensuring quick and reliable access to accounts while minimizing fraud risk. Robust online payment gateways integrated with the campus financial infrastructure guarantee swift and secure transactions. User account management and encrypted databases protect sensitive data, providing a user-friendly interface for students and efficient data management for administrators. This approach aims to establish a cohesive and reliable digital payment ecosystem tailored to campus needs.

**9.1 QR Code**

A QR code is a two-dimensional barcode that consists of black squares arranged on a white background. These square boxes are known as detection markers and play a key role in scanning and decoding the code.

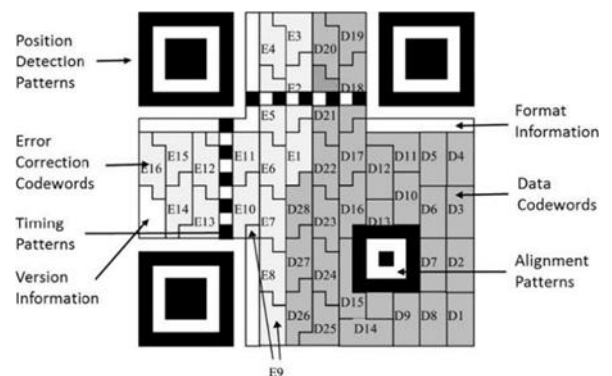


Fig -2: QR Code

The process of decoding a QR code starts with scanning it using a QR code scanner. Upon scanning, the scanner detects the alignment pattern, which helps in orienting the code correctly. Once the scanner identifies the alignment pattern, it proceeds to decode the data stored in the QR code. The data can be in the form of numeric, alphanumeric, binary, or kanji characters.

One essential aspect of QR codes is their error correction capability. QR codes have built-in error correction keys that enable the scanner to access the information even if the code is slightly damaged or missing some parts. With error correction keys, QR codes can withstand up to 30% damage without compromising their functionality.

**9.2 Micropayments**

The concept of micropayments has gained significant prominence with the advent of digital technology and the proliferation of online content and digital goods and services. Micropayments refer to small financial transactions, typically ranging from a few cents to a few



dollars, that fall below the threshold of traditional payment systems. These small transactions are often impractical or too costly to process using conventional payment methods due to high transaction fees and overhead costs. To address these challenges, APIs (Application Programming Interfaces) and micropayment platforms have emerged, providing the necessary infrastructure to facilitate the integration of micropayment systems into various applications. These tools enable developers to seamlessly incorporate small transactions into their applications, making it easier for users to pay for digital content and services in small increments. Micropayments are commonly associated with various types of digital content and services. For instance, many news websites and content creators use micropayments to monetize their content, allowing users to pay a small fee to access individual articles or specific pieces of content, making it a flexible and cost-effective option. Music platforms can offer individual song downloads or streaming access through micropayments, enabling users to purchase single tracks or temporary streaming rights without committing to a full album or subscription. In the gaming industry, micropayments are widely used for purchasing in-game items, upgrades, and additional content, enhancing the gaming experience without significant upfront costs. Many mobile apps utilize micropayments to offer premium features, ad-free experiences, or additional content, allowing users to make small payments to unlock specific functionalities or access exclusive content within the app. Beyond media and entertainment, micropayments are also used for various digital goods and services, such as e-books, software plugins, and online courses, reducing the financial barrier to entry for consumers. The rise of micropayment platforms has been instrumental in enabling these transactions, handling the complexities of processing small payments efficiently and securely, ensuring that both users and content providers benefit from the convenience and accessibility of micropayments. Overall, the concept of micropayments has revolutionized the way digital content and services are monetized, offering a flexible and user-friendly alternative to traditional payment models. By allowing consumers to pay in small increments, micropayments have made it easier for people to access and enjoy a wide range of digital offerings, fostering a more dynamic and inclusive digital economy.

## 10. ADVANTAGES OF PROJECT

- The app allows Users to access campus services and manage their accounts conveniently
- Streamlined processes such as canteen payments and library book borrowing save time and effort.
- Users can easily track their transactions, balances, and borrowed items, enhancing transparency.
- Users receive notifications for various activities like book issuances, due dates, and low balances, ensuring timely action.

- The app facilitates communication between students and administrators, allowing queries to be sent directly to admin email.
- Administrators can efficiently manage student data, transactions, and resources, enhancing administrative oversight.

## 11. CONCLUSION

Ultimately, the project presents a thorough way to optimize university services and enhance the correspondence between students and faculty. The software increases the effectiveness and transparency of overseeing student activities by giving users easy access to necessary services like the canteen, library, and stationery store. Thanks to functionalities like prompt alerts and efficient account administration, learners may remain informed and involved in their educational pursuits. This initiative showcases how technology may improve the entire experience of students in educational institutions and offers a solid platform for future improvements.

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